Name: _____ Math 10F&LPC H. Date: _____

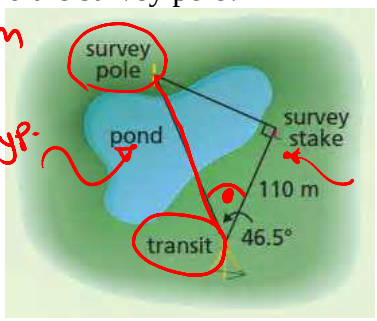
Chapter 2 Trigonometry

2.5 USING THE SINE AND COSINE RATIOS TO CALCULATE LENGTHS

Focus: Use the sine and cosine ratios to determine lengths indirectly.

The diagram below shows measurements taken by surveyors.

How could you determine the distance between the transit and the survey pole?



$\triangle$ $\angle t = 46.5^\circ$ hyp = ? Adj. = 110 m

hyp. Adj

* I can use Cos ratio to Find the missing side

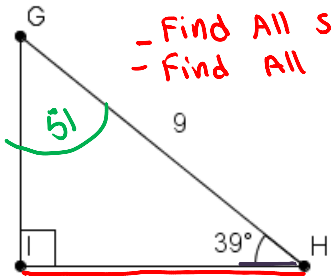
$$\cos 46.5^\circ = \frac{110}{H}$$

$$H = \frac{110}{\cos 46.5} = 159.8 \text{ m}$$

The sine and cosine ratios can be used to determine the length of a leg of a right triangle when the measure of an acute angle and the length of the hypotenuse are known.

Example1: Determine the length of HI.

Solve For the triangle
- Find All sides
- Find All angles



$\angle H = 39^\circ$ $H = 9$ $HI = A$

$$\cos 39^\circ = \frac{A}{9} \qquad A = (9)(\cos 39^\circ) = 6.99 \simeq 7$$

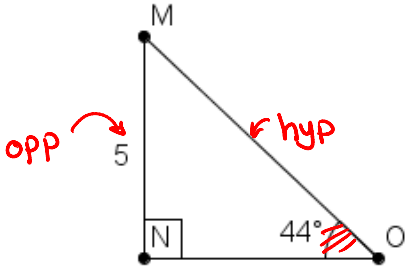
Solve For $\angle G = 51^\circ$

Solve For GI = opp.

$$\sin 39 = \frac{GI}{9} \qquad GI = (9)(\sin 39^\circ) = 5.65$$

The sine and cosine ratios can be used to determine the length of the hypotenuse of a right triangle when the measure of an acute angle and the length of one of the legs are known.

Example2: Determine the length of MO.

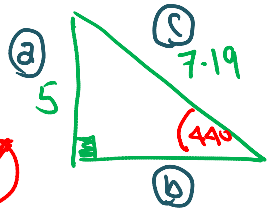


$$\sin 44^\circ = \frac{5}{MO}$$

$$MO = \frac{5}{\sin 44^\circ} = 7.19$$

Solve For NO and $\angle M$

$$\angle M = 90^\circ - 44^\circ = 46^\circ$$



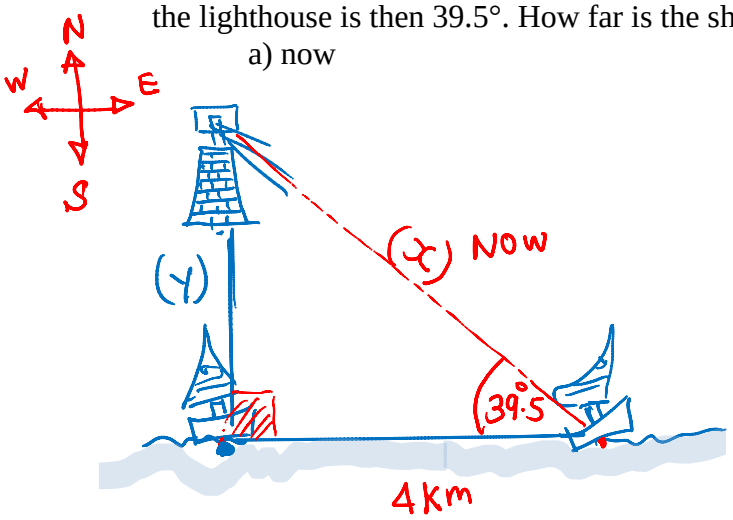
$$b = \sqrt{c^2 - a^2} = \sqrt{(7.19)^2 - (5)^2} = 5.16$$

$$\tan 44^\circ = \frac{5}{b} \qquad b = \frac{5}{\tan 44} = 5.17$$

Example3:

A ship is sailing off the coast. At a certain point, the navigator sees a lighthouse, due north of the ship. The ship then sails 4 km due east. The angle between the ship's path and the line of sight to the lighthouse is then 39.5°. How far is the ship from the lighthouse

a) now b) before the 4 km?



a) Now

$\cos 39.5 = \frac{4}{x}$

$x = \frac{4}{\cos 39.5} = 5.18 \text{ km}$

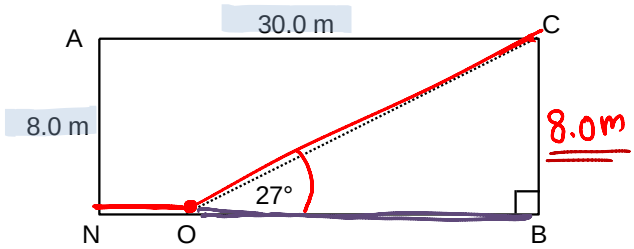
b) before the 4km

$\tan 39.5^\circ = \frac{y}{4}$

$y = (4)(\tan 39.5^\circ) = 3.29 \text{ km}$

Example4:

A rectangular lawn has the dimensions shown. A gardener wants to use an electric lawnmower to mow the lawn. The electrical outlet is located at O.



a) Determine the length of cord needed to reach corner C, to the nearest tenth of a meter.

OC = hyp

$\angle = 27$

8.0 = opp.

$\sin 27^\circ = \frac{8.0}{OC}$

$OC = \frac{8.0}{\sin 27^\circ} = 17.6 \text{ m}$

b) Determine the distance between the electrical outlet and corner N, to the nearest tenth of a metre.

Find OB

ON + OB = 30 m

opp = 8.0

$\angle = 27^\circ$

Adj = ?

$\tan 27 = \frac{8.0}{OB}$

$OB = \frac{8.0}{\tan 27} = 15.7 \text{ m}$

$ON = 30.0 - 15.7 = 14.3 \text{ m}$

Assignment: *page Q# 101 #4–11 + worksheet*